



**.98m Ka-Band Antenna  
Installation Guide**  
*Model: AN8-098R*

1037752-0001  
Revision A  
June 17, 2008

## Revision record

| Revision | Date of issue | Scope              |
|----------|---------------|--------------------|
| A        | June 17, 2008 | Production Release |

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# Important safety information

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For your safety and protection, read this entire installation guide before attempting to install the AN8-098R Ka-band antenna. In particular, read this safety section carefully. Keep this safety information where you can refer to it if necessary.

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## Types of warnings used in this manual

This section introduces the various types of warnings used in this manual to alert you to possible safety hazards.

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### **DANGER**



Indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

---

### **WARNING**



Indicates a potentially hazardous situation, which, if not avoided, could result in death or serious injury.

---

### **CAUTION**



Indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

---

### **CAUTION**

Indicates a situation or practice that might result in property damage.

---

## Product warning labels

The following safety alert labels are affixed to the antenna feed support arms, radio transmitter, and antenna reflector, respectively.



Feed support arm



Transmitter



Reflector (back side)

### Safety alert labels on the antenna assembly

These labels advise that the antenna emits radio frequency (RF) energy. Because of this potential safety hazard, observe all cautions on these labels and in the next section, *Antenna installation safety*.

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## Antenna installation safety

Observe the following precautions when installing the antenna. This manual also includes other safety alerts where appropriate concerning specific installation procedures.

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### WARNING



Only Hughes-certified installers may install or service Hughes antennas and their components. Installers must expressly acknowledge the Hughes requirements for Hughes installations.

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### DANGER



If you work on a roof, tower, or other high structure or use a ladder or scaffold to access the work site, follow these precautions to prevent personal injury or death:

- Walk only on sound roof structures.
  - Make sure the antenna assembly and installation surface are structurally sound so that they can support all loads (equipment weight, ice, and wind).
  - Use safety equipment (for example, a lifeline) appropriate for the work location.
  - Follow all manufacturer safety precautions for all safety and other equipment used.
  - Perform as many procedures as possible on the ground.
- 

### DANGER



- To avoid electric shock, stay at least 20 ft from power lines.
- If any part of the antenna or mount assembly comes in contact with a power line, call the local power company to remove it. *Do not try to remove it yourself.*

Failure to heed these warnings could result in serious injury or death.

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### WARNING



Properly ground the antenna assembly according to all federal and local electrical codes.

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### **WARNING**

- Do not work in high wind or rain; or if a storm, lightning, or other adverse weather conditions are either present or approaching.
  - Do not attempt to assemble, move, or mount the antenna on a windy day. Even a slight wind can unexpectedly create sudden strong forces on the antenna surface.
- 



### **CAUTION**

If the antenna or mount assembly begins to fall during the installation, do *not* attempt to catch it. Move away and let it fall.

---



### **WARNING**

Antennas that have been improperly installed or attached to an unstable structure are susceptible to wind damage, which can be very serious or even life threatening. The product owner and installer assume full responsibility that the installation is structurally sound to support all loads (weight, wind, and ice) and is properly sealed against leaks.

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## CAUTION

Observe these precautions to avoid exposure to RF radiation, a potential safety hazard:

- The antenna must be installed in a location not readily accessible to children and in a manner that prevents human exposure to potentially harmful levels of radiation.
- Antennas mounted in Puerto Rico, the continental United States, or at any site with a greater than 30° elevation angle must be installed such that the lower lip of the antenna reflector is at least 5 ft above any surface upon which a person might be expected to stand, and 3 ft 3 inches from any opening (such as a door or window) in a building or adjacent structure.
- Antennas mounted in Canada, Alaska, Hawaii, or any site with a less than 30° elevation must be installed such that the lower lip of the antenna reflector is at least 5 ft 9 inches above any surface upon which a person might be expected to stand, and 3 ft 3 inches from any opening (such as a door or window) in a building or adjacent structure.
- The antenna must be mounted such that no object that could reasonably be expected to support a person is within 6 ft 7 inches of the edges of a cylindrical space projecting outward from the antenna reflector toward the satellite.
- If the above distance requirements cannot be met, the antenna must be mounted in a controlled area inaccessible to the general public, such as a fenced enclosure or a roof.
- A fenced installation must have a locked entry, and the fenced area must be large enough to protect the general public from exposure to potentially harmful levels of radiation.
- Access to a roof installation in a commercial, industrial, or institutional environment must be limited by a door or a permanently fastened ladder that is locked to deny access to the general public.
- Once the transmitter becomes operational, maintain a safe distance; at least 3 feet.



Failure to observe these cautions could result in injury to eyes or other personal injury.

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 **CAUTION**



- All antennas of any type or size must carry an industry standard and government approved *Radiation Hazard Caution* label on the feed support arm.
- A fenced or roof installation in a commercial, industrial, or institutional environment must carry a *Radiation Hazard Caution* sign on the access door, gate, or permanently mounted access ladder within plain sight of anyone approaching the antenna from the front or sides of the reflector.

**Failure to observe these cautions could result in injury to eyes or other personal injury.**

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Note: Some installations may require additional precautions. See the HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001) for more information.

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# Chapter 1

## Overview

---

This Installation Guide explains how to assemble and install the Hughes AN8-098R .98m Ka-band antenna. It is written for qualified installers who are familiar with satellite antenna installation practices and are capable of properly applying the information presented herein.

This chapter presents an overview of the AN8-098R antenna, a summary of the steps used to assemble and install the antenna, and supplemental information on tasks related to antenna installation. These topics are included in the following sections:

- *The model AN8-098R antenna* on page 1
- *Antenna installation summary* on page 2
- *Tasks related to antenna installation* on page 4

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### The model AN8-098R antenna

Each satellite modem at a customer site requires an antenna and radio assembly to communicate with both the system satellite and the Network Operations Control Center (NOCC). The antenna is connected to the satellite modem by an intra-facility link (IFL) consisting of two cables: a transmit cable and a receive cable.

The Hughes model AN8-098R antenna is designed for Ka-band applications. Figure 1 shows the AN8-098R assembled, with a radio assembly.



Figure 1: The Hughes AN8-098R .98m Ka-band satellite antenna

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## Antenna installation summary

This section lists the basic steps and related tasks used to assemble and install the antenna. These procedures are listed in the order in which they are to be performed. For more detailed information on each task, refer to the chapters and documents listed.

1. Explain the installation process to the customer.
2. Conduct a site survey with the customer to identify a suitable location for the antenna. See the HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001) for details.

3. Install and apply power to the satellite modem, following the instructions in the installation guide for the specific satellite modem you are installing.



Note: You must install the satellite modem before installing the antenna to determine the proper pointing values (azimuth, elevation, and tilt).

4. Connect your laptop computer to the satellite modem and enter the installation parameters from the installation reference sheet.
5. Determine the most suitable method for mounting the antenna and install the antenna mast. See the ***Antenna Site Preparation and Mount Installation Guide*** for details.



Note: It is critical that the antenna mast is plumb. The antenna cannot be adjusted to correct for a mast that is not plumb.

6. Attach the antenna reflector bracket and tilt plate to the Az/El mount. See Chapter 3 – *Installing the antenna and radio assembly*.
7. Install the feed support arms and tailpiece. See Chapter 3 – *Installing the antenna and radio assembly*.
8. Attach the antenna reflector. See Chapter 3 – *Installing the antenna and radio assembly*.
9. Install the radio assembly, adjusting circular polarization if necessary. See Chapter 3 – *Installing the antenna and radio assembly*.
10. Install the feed horn. See Chapter 3 – *Installing the antenna and radio assembly*.
11. Attach the Az/El mount and antenna assembly to the antenna mast pipe. See Chapter 3 – *Installing the antenna and radio assembly*.
12. Install the IFL transmit and receive cables between the satellite modem and the antenna. See Chapter 4 – *Cabling and connections*.
13. Ground the antenna assembly. See *Tasks related to antenna installation* on page 4.
14. Determine the proper azimuth, elevation, and tilt. See Chapter 3 – *Installing the antenna and radio assembly*.
15. Point the antenna in accordance with the instructions in the ***Ka-Band Antenna Pointing Guide*** (1037663-0001).
16. Commission the satellite modem. For instructions, see the installation guide for the specific satellite modem you are installing.

---

## Tasks related to antenna installation

This section explains where to find information on tasks related to antenna installation.

### Selecting the installation site

The first and most important consideration when choosing a prospective antenna site is whether the area can provide an acceptable line of sight (LOS) to the satellite. A site with a clear, unobstructed view of the southern sky is necessary. Also, consider obstructions that may occur in the future, such as the growth of trees. Select your antenna site before performing the installation, so that the antenna will be able to receive the strongest signal available.

Before selecting an installation site, check the installation reference sheet to see if a customer-specific installation site has been pre-determined and specified. Also, refer to the HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001), which discusses the factors that you should consider when selecting an antenna installation site.

As with any type of construction, a local building permit may be required before installing the antenna. It is the property owner's responsibility to obtain all permits. Install the antenna in accordance with local building codes.

### Installing the antenna mount

Before installing the antenna, you must first install a suitable antenna mount. If the system requires a pole mount installation, be sure to obtain information about the underground utilities in the proposed location. Have the appropriate utility company mark the location of any underground telephone wires, storm drains, etc. Also, because soils vary widely in composition and load capacity, it may be necessary to consult a local professional engineer to determine the appropriate foundation design.

For pole mounts that require a concrete base, you must allow at least 24 hr for the concrete to cure before installing the antenna. Be sure to plan and schedule the installation accordingly.

For complete information regarding antenna mount installation, including various mounting methods, refer to:

- The customer-specific installation reference sheet
- The HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001).

Refer to the installation reference sheet for any customer-specific guidelines concerning the mount installation. Use only the installation method described in the reference sheet.

If the installation reference sheet does not specify a method, use only the mount installation methods documented in the HughesNet *Antenna Site Preparation and Mount Installation Guide*. Most installations in a commercial, industrial, or institutional environment use a non-penetrating roof mount.

**Installing the satellite modem** See the installation guide for the specific satellite modem you are installing.

**Grounding** The entire antenna assembly must be grounded. For grounding information, refer to your training, best grounding practices, the Hughes Field Service Bulletin (FSB) *HNS Broadband Requirements for RG-6 and RG-11 IFL Cable Connectors, Ground Blocks and Ground Block Location* (FSB 050518\_01), and applicable parts of the National Electrical Code (NEC).

**Approved cables** For a list of approved cables for the IFL between the antenna and the satellite modem, see the Hughes FSB, *IFL Cable, Approved List (with lengths) for SPACEWAY Domestic Installations* (FSB 080111\_01). The FSB lists the maximum cable length for each approved cable type for all relevant radio types.

Because it is impossible to predict the requirements specific to each installation site, you must use your own judgement and best practices to determine how to route and connect the IFL transmit and receive cables.



# Antenna parts and required tools

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This chapter describes the components and parts provided with the AN8-098R Ka-band antenna kit. It contains the following sections:

- *Antenna kit components* on page 7
- *Small hardware parts list* on page 14
- *Tools* on page 15

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## Antenna kit components

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### CAUTION



**Metal components may contain sharp edges. Use care when un-packing and handling antenna parts.**

---

This section identifies and describes the main components of the .98m Ka-band antenna kit. The antenna kit is shipped in three containers. Figure 2 identifies the contents of each container.



Note: To avoid potential damage, leave all components in their protective packages until required.

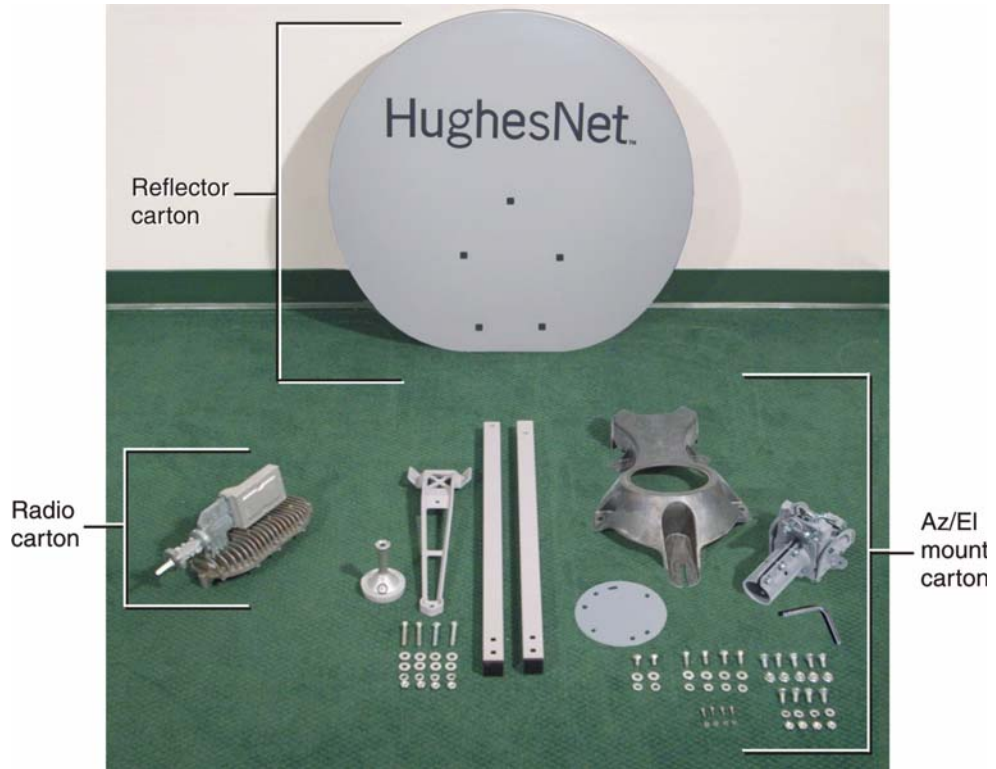


Figure 2: Antenna kit components



Note: The radio assembly is shipped separately and may not arrive at the same time as the other two cartons.

The main components of the antenna kit are:

- Az/EI mount assembly
- Reflector bracket
- Tilt plate
- Feed support arms and tailpiece
- Feed horn
- Elevation handle
- Antenna reflector
- Radio assembly

Related components (not shown):

- Tri-mast or other antenna mount

The following sections describe each component of the antenna kit.

**Az/El mount assembly** The *Az/El mount assembly*, shown in Figure 3, consists of the Az/El canister, the elevation scale, and the fine azimuth and fine elevation tools. The Az/El canister supports the antenna. The fine azimuth and elevation tools are used to finely adjust the azimuth and elevation of the reflector during antenna pointing. The elevation scale is used to measure the antenna's elevation during the pointing phase.

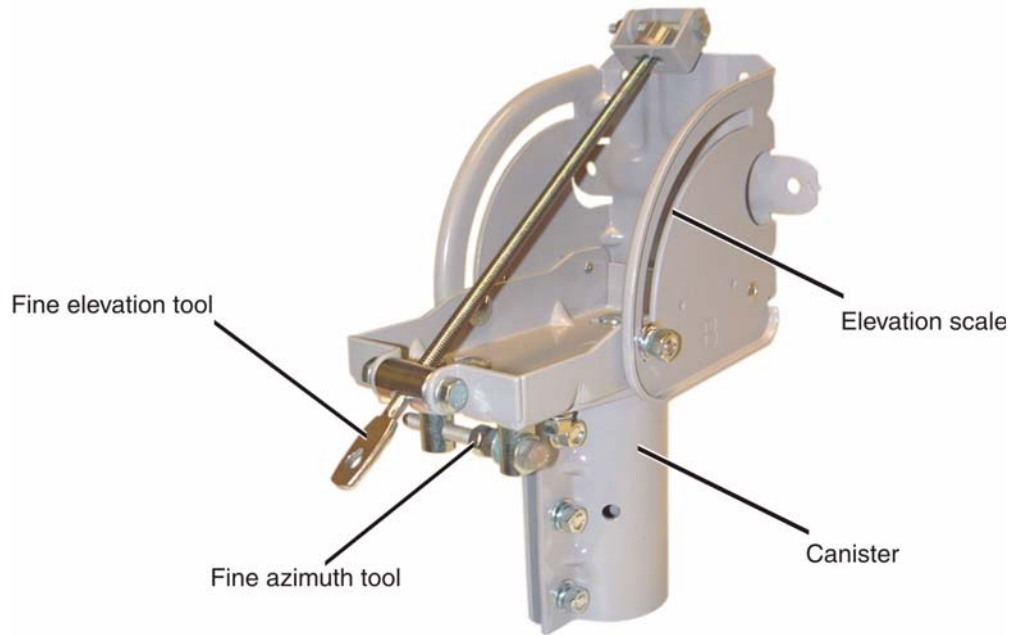


Figure 3: Az/El mount assembly

**Reflector bracket and tilt plate**

The *reflector bracket* supports the antenna reflector and allows the reflector to rotate so that it can be adjusted for proper tilt. The reflector bracket plate attaches to the Az/EI mount assembly. Figure 4 shows the reflector bracket and tilt plate.

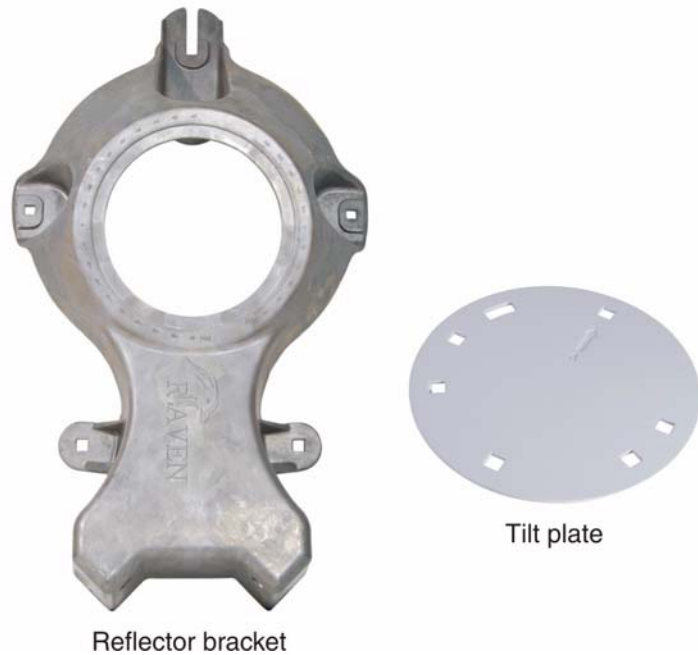


Figure 4: Reflector bracket and tilt plate

**Antenna reflector**

The antenna *reflector* shown in Figure 5 focuses the transmitted and received RF signals. It attaches to the reflector bracket.



Figure 5: Antenna reflector

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## CAUTION

To avoid damage to the antenna reflector, handle it with care. After assembly, do *not* use the reflector to rotate the antenna.

---

### Feed support arms and tailpiece

Figure 6 shows the two *feed support arms* and the *tailpiece*. The feed support arms attach to the antenna assembly at the reflector bracket. The tailpiece is mounted to the ends of the feed support arms and supports the radio assembly and feed horn.



Feed support arms

Tailpiece

Figure 6: Feed support arms and tailpiece

**Radio assembly** The *radio assembly* shown in Figure 7 consists of the radio transmitter, low noise block converter (LNB), transmit/receive isolation assembly (TRIA), and polarizing waveguide.

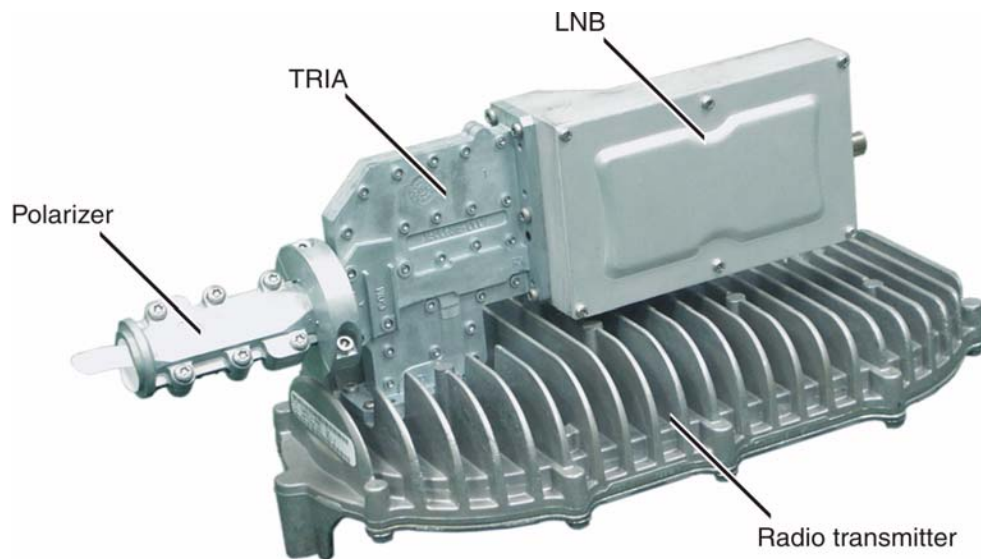


Figure 7: Radio assembly

**Feed horn and collar** The *feed horn*, shown in Figure 8, attaches to the polarizer on the radio assembly by way of the two-piece *collar*. The feed horn gathers the reflected signal from the reflector and focuses it toward the LNB.



Figure 8: Feed horn and collar

**Elevation handle** The *elevation handle*, shown in Figure 9, is used to adjust the elevation of the antenna after assembly and installation.

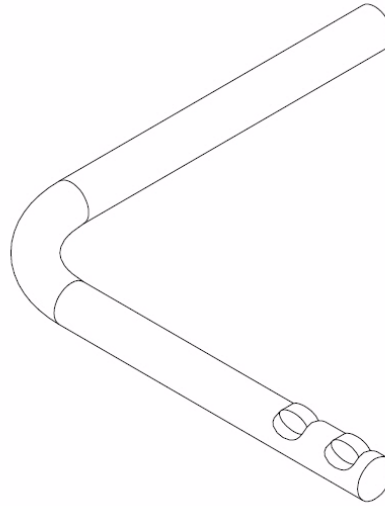


Figure 9: Elevation handle

### Related Components

***Tri-mast (or other antenna mount)*** Although the tri-mast is not part of the antenna kit, it is described here because it is the most commonly used mounting option for the AN8-098R Ka-band antenna. As shown in Figure 10, the tri-mast can be positioned in a number of configurations to adapt it for mounting onto surfaces of various angles. For other suitable antenna mounting options, see the HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001).

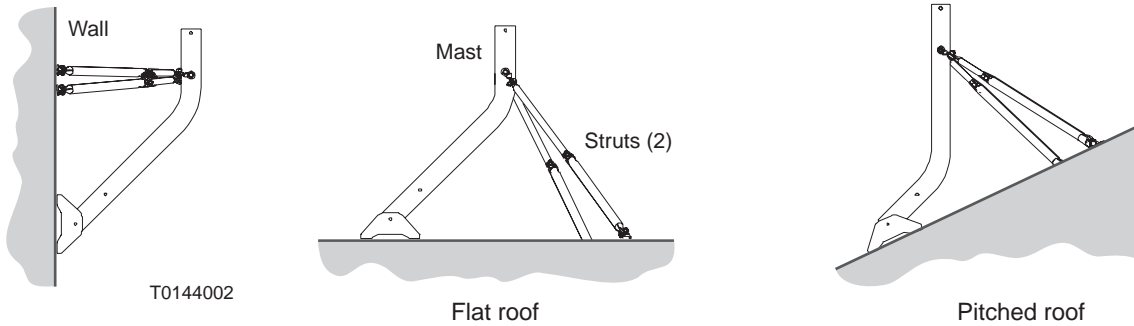


Figure 10: Tri-mast in various configurations

## Small hardware parts list

Table 1 lists the small hardware parts included in the antenna kit.

Table 1: Small hardware parts

| Part   | Quantity | Listed parts are used to attach...                           | Illustration showing where parts are used |
|--|----------|--|---|
| 5/16-inch x 1-inch carriage bolts                  | 5        | Reflector bracket and tilt plate and to Az/EI mount assembly | Figure 11 on page 19                      |
| 5/16-inch flat washers                             | 5        |  |   |
| 5/16-inch lock washers                             | 5        |  |   |
| 5/16-inch hex nuts                                 | 5        |  |   |
| 5/16-inch x 3/4-inch hex head self-tapping bolts   | 4        | Feed support arms to reflector bracket                       | Figure 13 on page 21                      |
| 5/16-inch flat washers                             | 4        | Tailpiece to feed support arms                               | Figure 14 on page 22                      |
| 5/16-inch x 1 3/4-inch hex head self-tapping bolts | 4        |  |   |
| 5/16-inch flat washers                             | 4        |  |   |
| 5/16-inch lock washers                             | 4        |  |   |
| 5/16-inch hex nuts                                 | 4        | Reflector to Az/EI mount assembly                            | Figure 16 on page 23                      |
| 5/16-inch x 3/4-inch carriage bolts                | 5        |  |   |
| 5/16-inch serrated flange nuts                     | 5        | Radio assembly (transmitter) to tailpiece                    | Figure 18 on page 25                      |
| 5/16-inch x 1/2-inch hex head bolts                | 2        |  |   |
| 5/16-inch flat washers                             | 2        |  |   |
| 5/16-inch lock washers                             | 2        |  |   |
| O-ring   | 1        | Feed horn to radio assembly                                  | Figure 22 on page 29                      |
| #6-32 (3mm) hexagonal socket head (Allen) screws   | 2        |  |   |
| #6-32 (3mm) flat washers                           | 2        |  |   |

---

## Tools

Table 2 lists the tools required to assemble and install the antenna.

Table 2: Tools and additional materials required to assemble and install the antenna

| Tool or material                             | Details  |
|--|--|
| Socket wrench, ½-inch                        | For 5/16-inch bolts.   |
| 2 open-end wrenches, ½-inch                  | For 5/16-inch bolts. Some nuts and bolts require a second wrench to prevent turning.               |
| Torque wrench                                | With 5/16-inch sockets capable of torquing to 8 ft-lb.   |
| Long-shaft hexagonal Allen wrench, 7/64-inch | For Allen screws with a 7/64-inch hexagonal socket. Driver shaft should be at least 5 inches long. |
| Torque wrench for hexagonal socket           | Must fit a 7/64-inch hexagonal socket and be capable of torquing to 15 in-lb.                      |
| Bubble level                                 | Used to make sure that the mast is plumb.  |
| Compass                                      | Used to determine antenna azimuth.   |
| Pencil                                       | Carpenter's pencil.  |
| Weather grade silicon sealant                | Used to keep moisture away from cable connections.   |
| Weatherproofing tape                         | Used to keep moisture away from cable connections.   |
| Approved RG6 cable                           | Used for IFL between satellite modem and antenna.  |
| UV-rated cable ties                          | Used to secure slack in cables to antenna mast.  |



## Chapter 3

# Installing the antenna and radio assembly

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This chapter explains how to assemble and install the antenna, radio assembly, and associated hardware. Topics in this chapter include:

- *Determining the pointing values* on page 17
- *General instructions for assembling the antenna* on page 18
- *Installing the antenna reflector bracket and tilt plate* on page 19
- *Installing the feed support arms and tailpiece* on page 20
- *Installing the antenna reflector* on page 22
- *Installing the radio assembly* on page 24
- *Installing the feed horn* on page 28
- *Installing the antenna assembly onto the mast pipe* on page 30

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### CAUTION



**Before you install the antenna, read all safety information in *Important safety information* on page iii.**

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### Determining the pointing values

Before installing the antenna, you must install and power up the satellite modem. Refer to the appropriate satellite modem installation guide for instructions.

Once the satellite modem is operational, connect it to your laptop using an Ethernet cable, then use your global positioning system (GPS) receiver to calculate the exact latitude and longitude of the antenna site. Follow the instructions in the HughesNet ***Ka-Band Antenna Pointing Guide*** (1037663-0001) to enter the latitude and longitude information to determine the initial antenna azimuth, elevation, and tilt values. Record these values and keep them handy for reference as you install and point the antenna.

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## General instructions for assembling the antenna

Before you assemble the antenna, read these important instructions:

- Mast – *The mast must be installed before you can install the antenna.* For information on installing the antenna mast, see the HughesNet *Antenna Site Preparation and Mount Installation Guide* (1035678-0001).



Note: The outside diameter of the mast must be 2 3/8 inches.

- Sequence of steps – When you assemble the antenna, *be sure to follow the instructions in this chapter in the order they are presented.*

---

### **WARNING**



**For rooftop installations, assemble the antenna on the ground and then carry the fully assembled antenna up to the roof.**

- 
- Tightening hardware – *Do not tighten any nuts or other hardware until instructed to do so.* (See also the next item, *Torque.*)
  - Torque – To ensure successful installation of the antenna, it is critical that you tighten all nuts and socket-head screws to the maximum torque values shown in Table 3.

Table 3: Torque specifications

| Fastener       | Maximum torque |
|----------------|----------------|
| 1/2-inch bolts | 8 ft-lb.       |
| 1/4-inch bolts | 5 ft-lb.       |

## Installing the antenna reflector bracket and tilt plate

Begin the antenna assembly by attaching the antenna reflector bracket to the Az/EI mount:

1. Hold the reflector bracket in position over the Az/EI mount so that the tilt scale on the outside of the reflector bracket faces the mount, as shown in Figure 11.

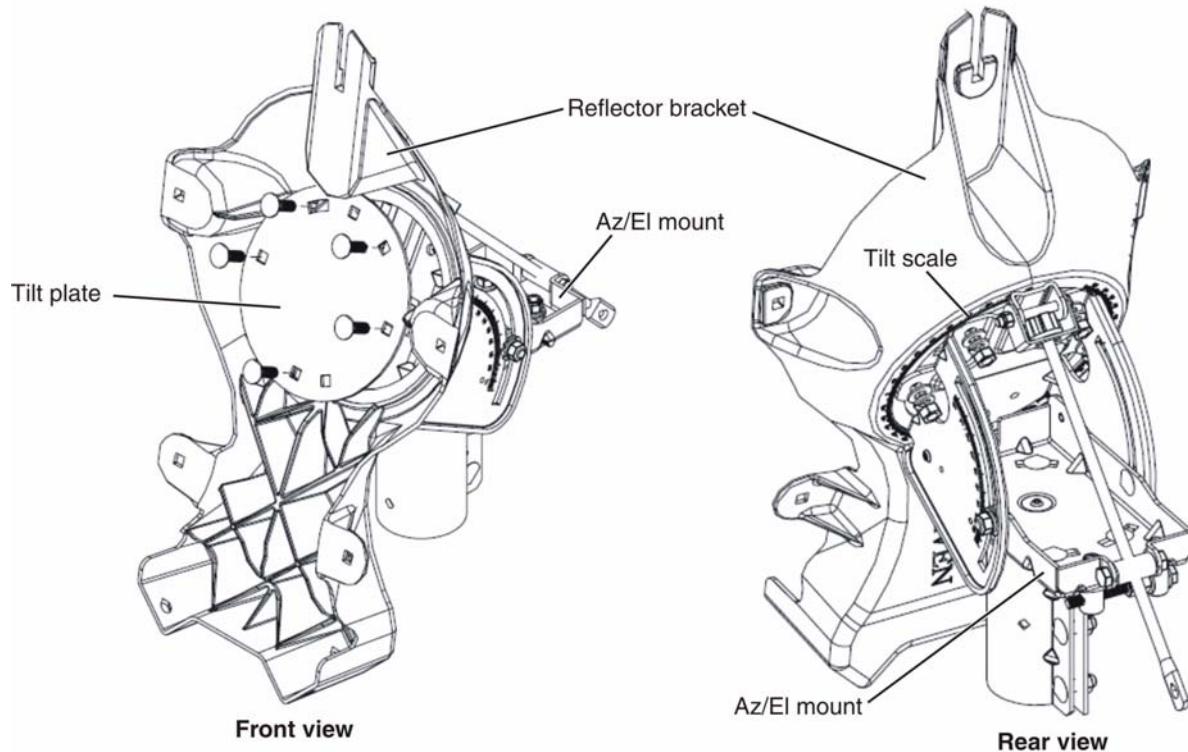


Figure 11: Attaching the reflector bracket

2. While holding the reflector bracket in position, lay the tilt plate over the opening in the reflector bracket so that the letter A on the tilt plate lines up with the letter A on the arm of the Az/EI mount as shown in Figure 12 on page 20. Because the hole pattern in the tilt plate is not symmetrical, *be sure that the two “A” indicators are aligned.*
3. Insert five carriage bolts ( $\frac{1}{2}$ -inch  $\times$  1-inch) into the holes in the tilt plate and through the corresponding holes in the Az/EI mount. You are going to bolt the tilt plate to the Az/EI mount, with the reflector bracket between them.



Be sure that the A on the Az/EI mount lines up with the A on the tilt plate.

Figure 12: Aligning the Az/EI mount

4. Secure the assembly by placing a flat washer, lock washer, and ½-inch nut on each carriage bolt, as shown in Figure 11 on page 19. Tighten each nut to 8 ft-lb using a torque wrench. Once connected, the reflector bracket should rotate freely between the Az/EI mount and the tilt plate.



Note: Tighten all 5/16-inch bolts to a maximum torque of 8 ft-lb.

When the reflector bracket and tilt plate are correctly positioned on the Az/EI mount assembly, you should be able to clearly see the tilt scale numbers on the reflector bracket from the rear, as shown in Figure 12.

## Installing the feed support arms and tailpiece

Installation of the feed support arm is a two-step process. First, you must connect the two feed support arms to the reflector bracket; then you will connect the tailpiece (sometimes referred to as the “beaver tail”) to the ends of the feed support arms.

1. Insert the feed support arms into the two sockets at the bottom of the reflector bracket, as shown in Figure 13.



Note: The two feed support arms are *not* identical. Be sure to insert each arm into its appropriate socket as shown in the figure, so that the holes in the feed support arms line up with the corresponding holes in the reflector bracket.

2. Fasten the feed support arms to the reflector bracket by inserting a 5/16-inch  $\times$   $\frac{3}{4}$ -inch self-tapping bolt with flat washer into each hole in the feed support arms, then tighten until secure.

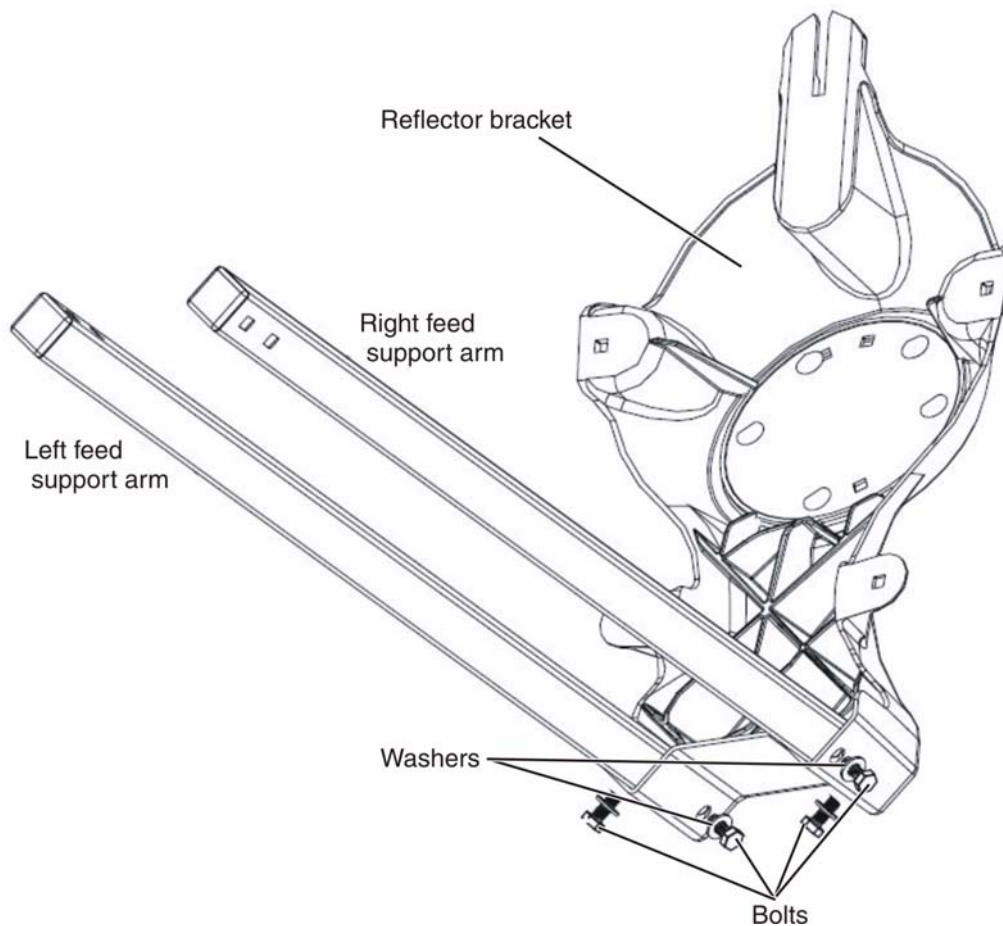


Figure 13: Attaching the feed support arms to the reflector bracket

3. Attach the tailpiece to the free ends of the two feed support arms as shown in Figure 14, using four 5/16-inch  $\times$   $1\frac{3}{4}$ -inch self-tapping bolts, flat washers, lock washers, and nuts.

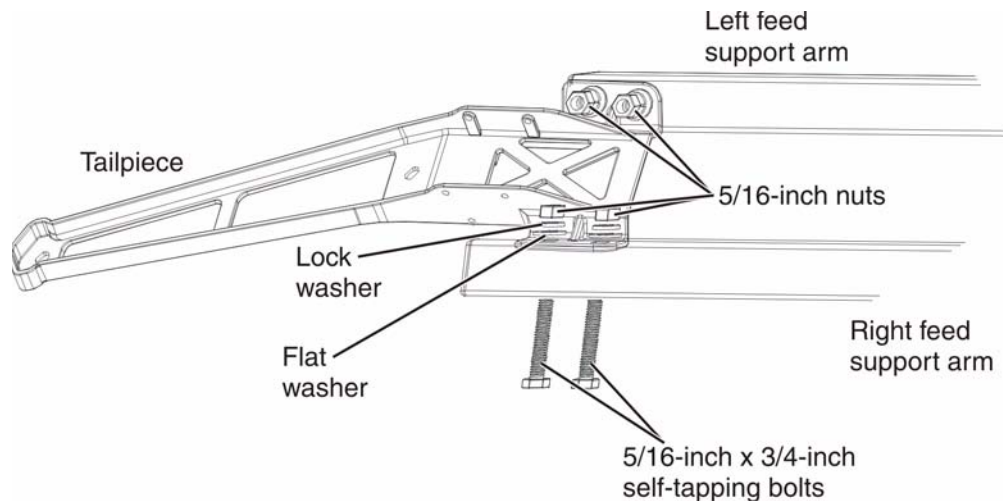


Figure 14: Attaching the tailpiece

## Installing the antenna reflector

To attach the antenna reflector to the reflector bracket:

1. Insert a 5/16-inch x 3/4-inch carriage bolt through the top hole of the reflector as shown in Figure 15, and place a 5/16-inch flange nut on the bolt from the back. Do *not* tighten at this time.



Figure 15: Insert first bolt into top hole

2. Hold the reflector against the reflector bracket and lower it onto the bracket, allowing the bolt to slide down into the alignment fork at the top of the antenna bracket, as shown in Figure 16.

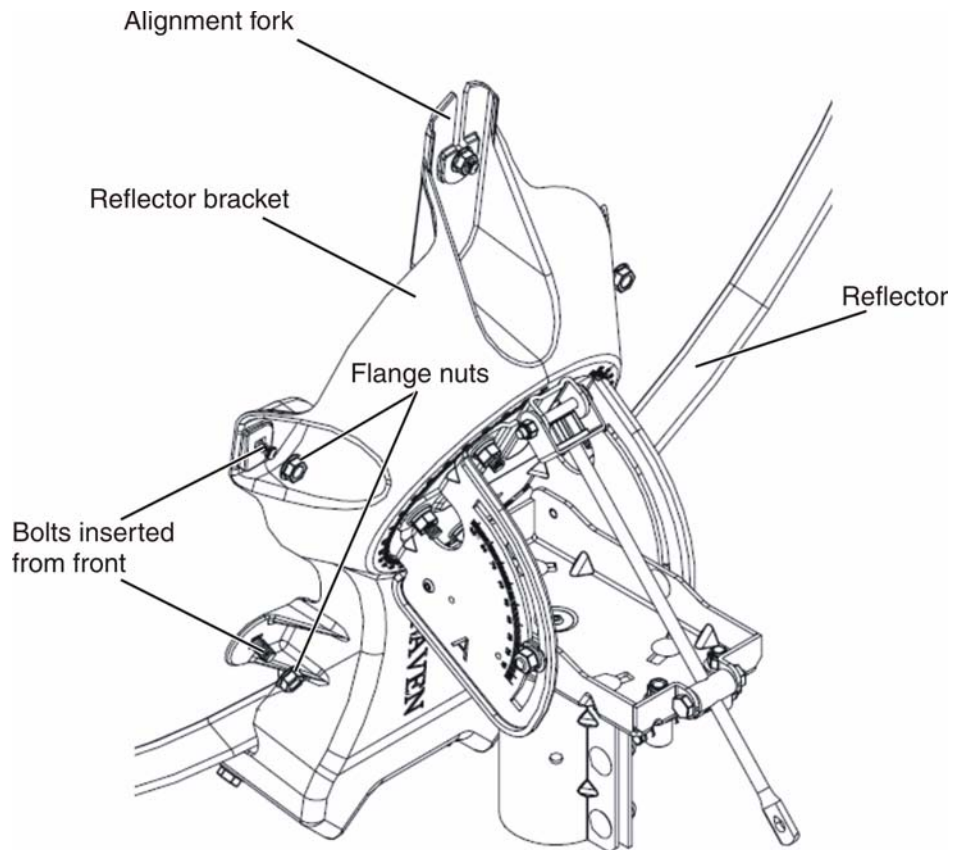


Figure 16: Attaching the antenna reflector (rear view)

3. Insert the remaining four carriage bolts into the holes in the reflector and through the corresponding holes in the bracket as shown in the figure.
4. Secure the bolts at the back of the reflector bracket, using four 5/16-inch flange nuts.



Note: Ensure that the carriage bolts are firmly seated into the square holes in the reflector before tightening the nuts.

---

## Installing the radio assembly

To mount the radio assembly to the tailpiece:

1. Position the radio assembly above the tailpiece so that the waveguide end of the radio is nearest to the reflector, as shown in Figure 17.

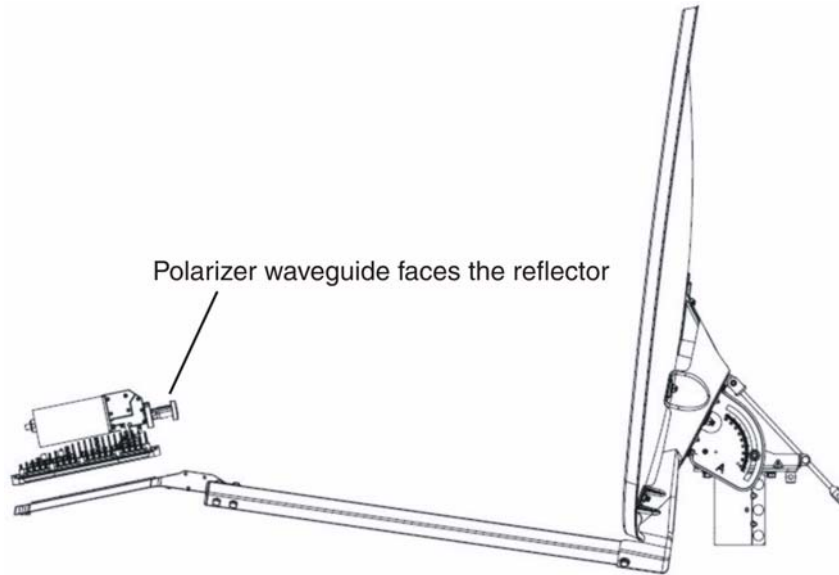


Figure 17: Positioning the radio

2. Insert two 5/16-inch  $\times$  1/2-inch self-tapping bolts, with flat washers and lock washers, up through the tailpiece from underneath, and into the threaded sockets on the bottom of the radio transmitter, as shown in Figure 18.
3. Tighten the two bolts with a wrench until secure.

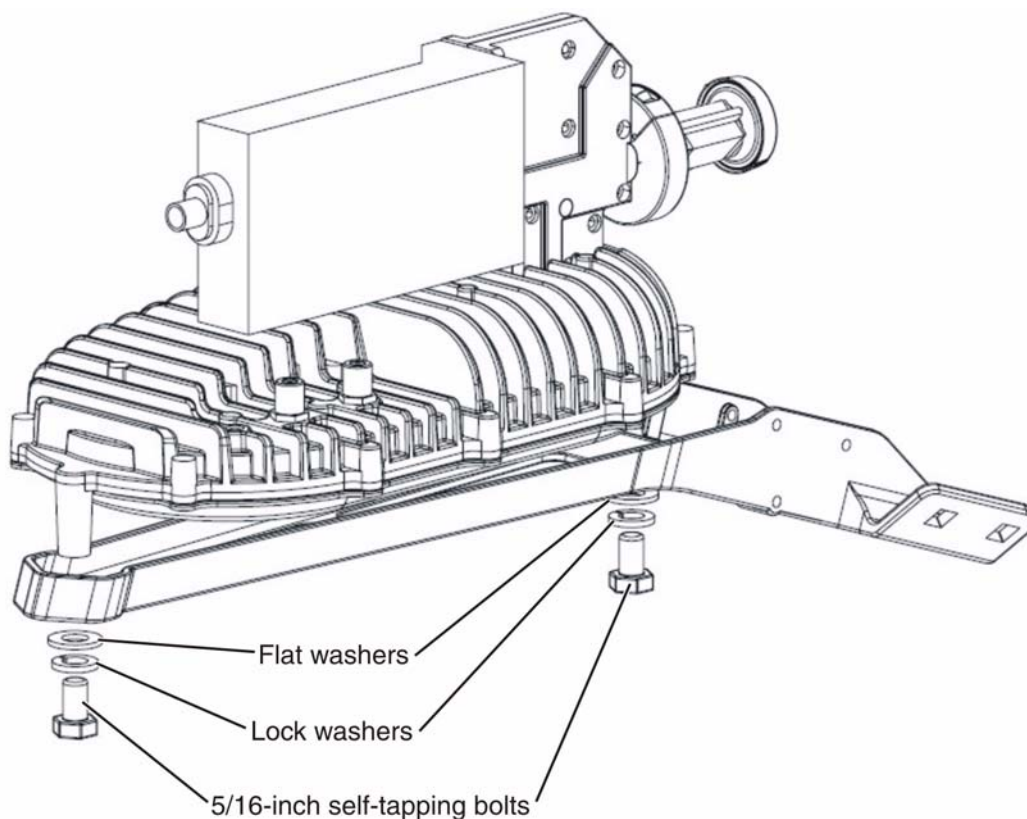


Figure 18: Attaching the radio assembly to the tailpiece

### Adjusting transmit circular polarization

It may be necessary to reposition the polarizer waveguide on the radio assembly to set the proper polarization between the radio transmitter and the antenna reflector. Before proceeding with the installation, check the installation reference sheet to determine whether the installation calls for left-hand circular polarization (LHCP) or right-hand circular polarization (RHCP).

Once you determine which polarization setting is required, check the position of the polarizer waveguide to determine whether an adjustment is necessary. From the rear of the radio, looking toward the reflector, you can easily determine whether the polarizer is currently set for LHCP or RHCP by the way it leans. (See Figure 19.)



Note: There is no default factory setting for transmit polarization. Radios can be shipped with either setting.

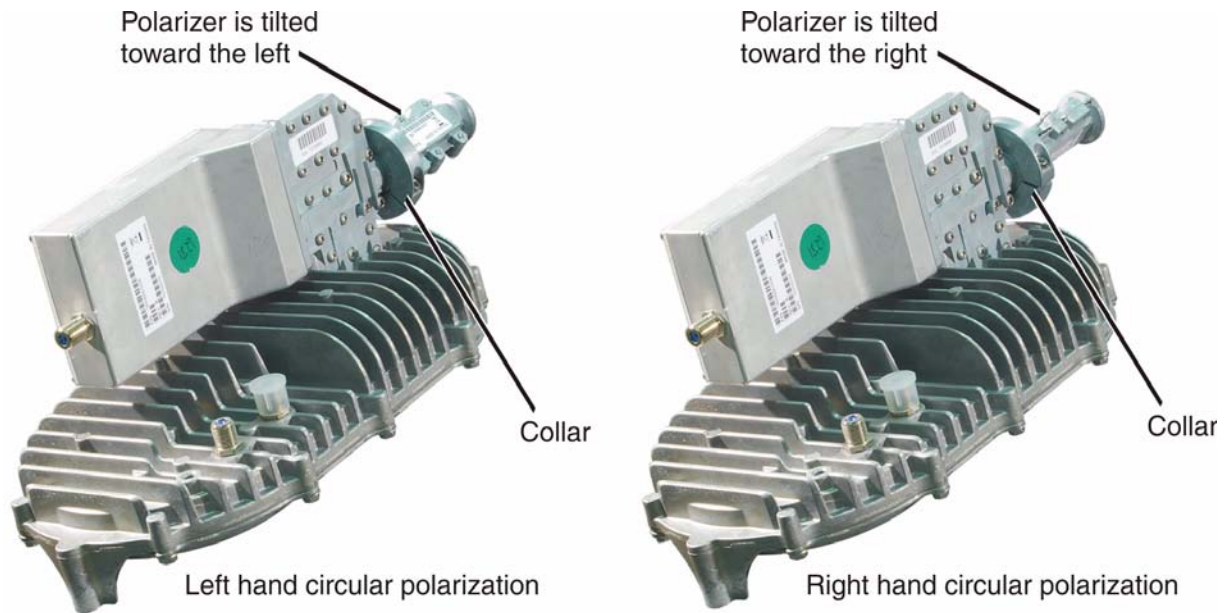


Figure 19: Determining the polarization setting

To reposition the polarizer:

1. Remove the two-piece polarizer collar by loosening and removing the two Allen screws.
2. Separate the polarizer from the TRIA and rotate it one quarter turn (clockwise for LHCP and counter-clockwise for RHCP), until the appropriate notch lines up with the key on the end of the TRIA. As shown in Figure 20, the LHCP notch is adjacent to the L on the polarizer and the RHCP notch is adjacent to the R on the polarizer).
3. Reseat the waveguide with the TRIA and reassemble the collar.

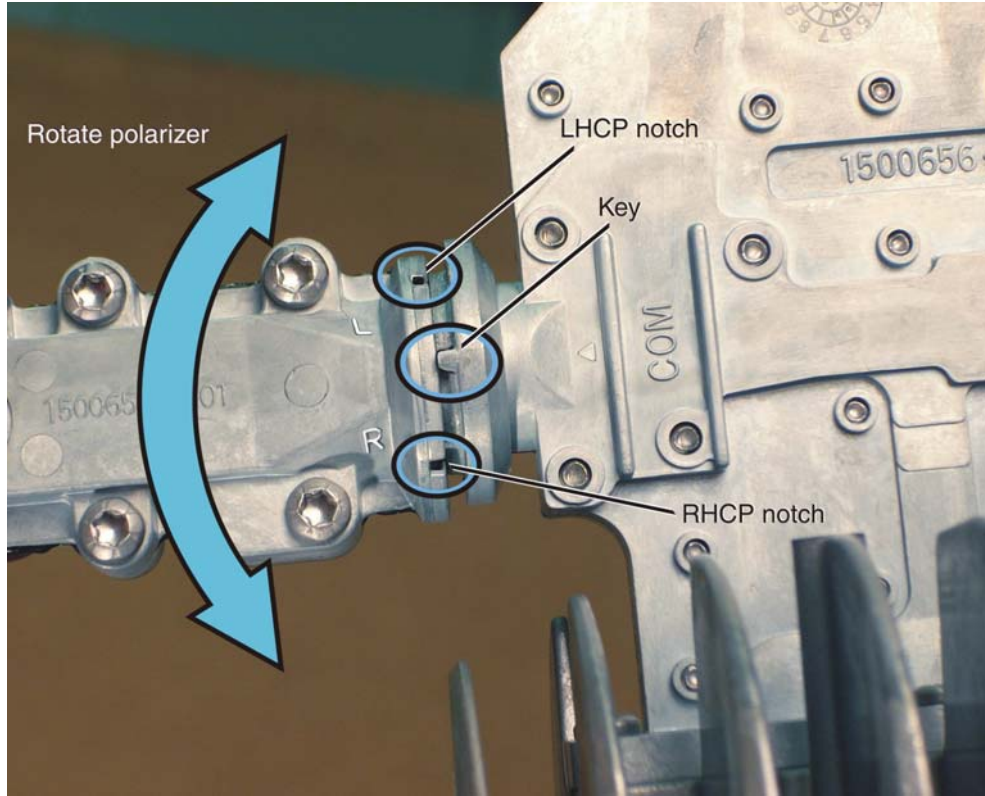


Figure 20: Adjusting circular polarization (collar removed)

## Installing the feed horn

To attach the feed horn to the radio assembly:

1. Remove and discard the protective seal from the polarizer on the radio assembly (shown in Figure 21).

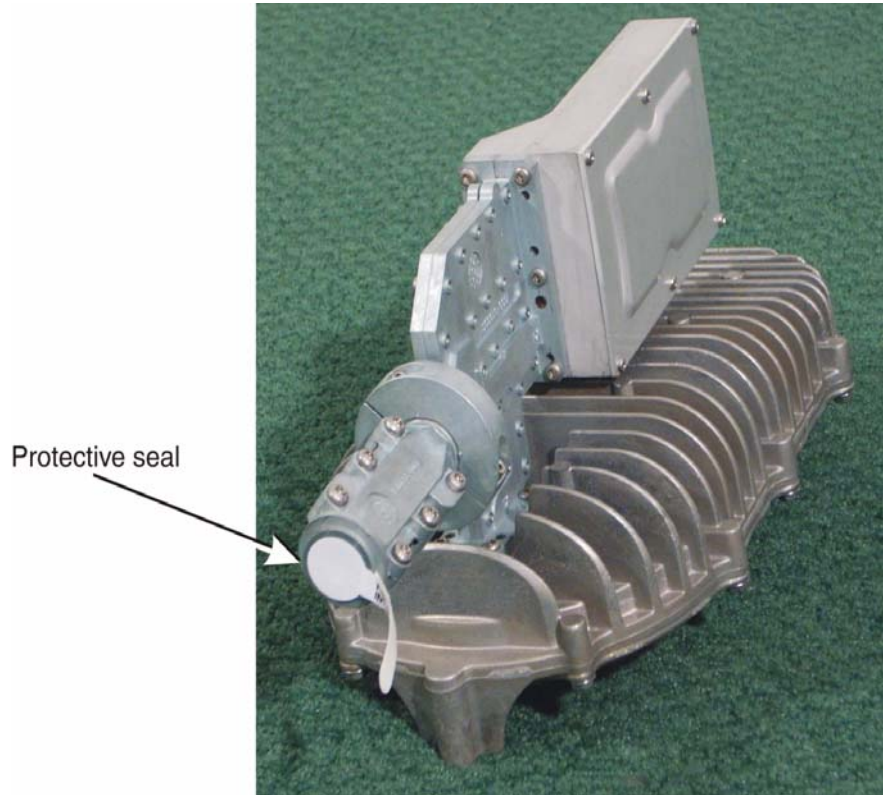


Figure 21: Remove the protective seal from the polarizer

2. Remove the dust cap from the stem of the feed horn and insert the O-ring into the groove inside the stem.
3. Position the feed horn against the waveguide as shown in Figure 22
4. As shown in the figure, fit the two sections of the feed horn collar around the ridge at the point where the feed horn meets the polarizer.

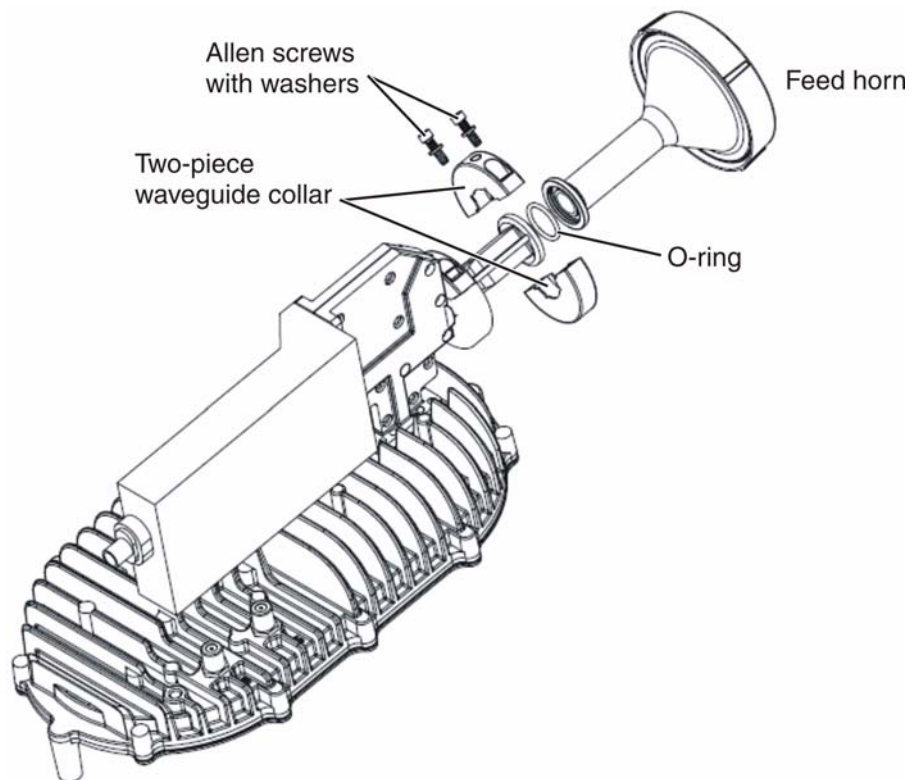


Figure 22: Attaching the feed horn

5. Insert and tighten two Allen screws into the collar to secure the feed horn in place.
6. At this point, fully tighten any hardware that is not tight—however, leave nuts that are used for pointing adjustments slightly loose or just snug.

## Installing the antenna assembly onto the mast pipe

Follow these steps to install the assembled antenna assembly onto the mast pipe:

1. Before you install the Az/EI mount assembly onto the mast pipe, use a bubble level to verify that the mast is plumb. The mast *must* be plumb before you install the antenna assembly. Check the mast at two locations, 90° apart, as shown in Figure 23.

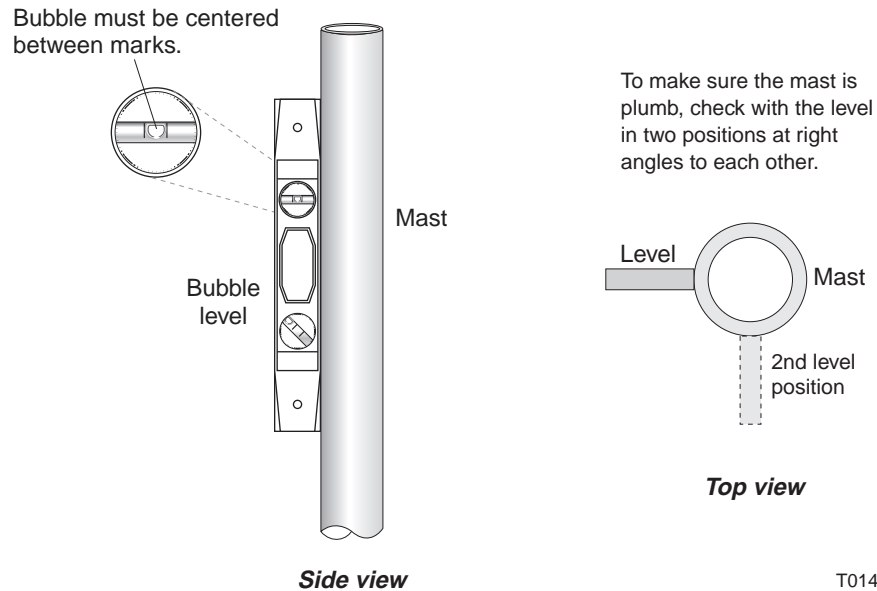


Figure 23: Making sure the mast is plumb

2. Slide the Az/EI mount assembly canister down onto the mast pipe as shown in Figure 24.



Note: The outside diameter of the mast must be 2 3/8 inches.

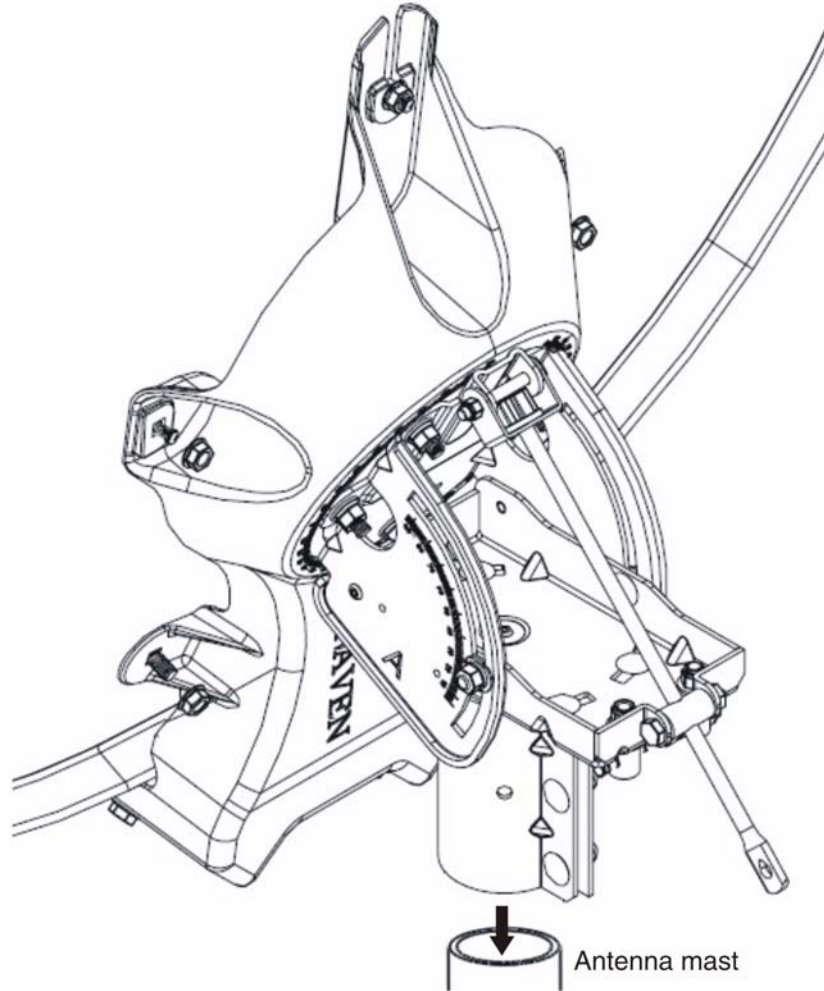


Figure 24: Installing the antenna assembly onto the mast



Note: For vertical mounts, fill all holes with weather-grade silicon sealer before inserting bolts or screws. For horizontal mounts, fill all holes with the appropriate asphalt-based, synthetic-rubber, or acrylic co-polymer roof sealant.

This completes the assembly phase of the antenna installation process. Depending on its orientation, the antenna should look similar to the one shown in Figure 25.



Figure 25: Assembled antenna

To proceed with the installation, you must route the IFL Tx and Rx cables between the antenna and the satellite modem. See Chapter 4 – *Cabling and connections*.

## Chapter 4

# Cabling and connections

---

This chapter illustrates where the antenna transmit, receive, and ground connectors are located; shows how to route the transmit and receive cables at the antenna; and explains how to connect the transmit and receive cables to the radio assembly. You must connect all of these cables before you can point the antenna toward the HughesNet satellite.

Topics in this chapter include:

- *Cabling requirements* on page 33
- *Routing the cables at the antenna* on page 34
- *Connecting the transmit and receive cables* on page 36
- *Ground connections* on page 38

---

### Cabling requirements

For a list of approved cables for the intra-facility link (IFL) between the antenna and the satellite modem, see the Hughes FSB, *IFL Cable, Approved List (with lengths) for SPACEWAY Domestic Installations*, (FSB 080202\_01). The FSB lists the maximum cable length for each approved cable type, for all relevant radio types.

Because it is impossible to predict the requirements specific to each installation site, you must use your own judgement and best practices to determine how to route and connect the IFL cables.

---

### CAUTION

**Coaxial cables and connectors can corrode if exposed to moisture. Use *only* compression type connectors, and weatherproof them with dielectric grease and weatherproofing tape.**

---



Note: For connector requirements, see the Hughes FSB, *HN Broadband Requirements for RG-6 and RG-11 IFL Cable Connectors, Ground Blocks and Ground Block Location* (FSB 050518\_01).

## Routing the cables at the antenna

Route the coaxial Tx and Rx cables at the antenna as follows:

1. Route the Tx cable (marked with blue electrical tape) over the Az/EI mount assembly, down behind the reflector, and along the feed support arms to the rear of the transmitter, in a configuration similar to that shown in Figure 26.



Note: Do *not* exceed the minimum bending radius specified by the cable manufacturer.

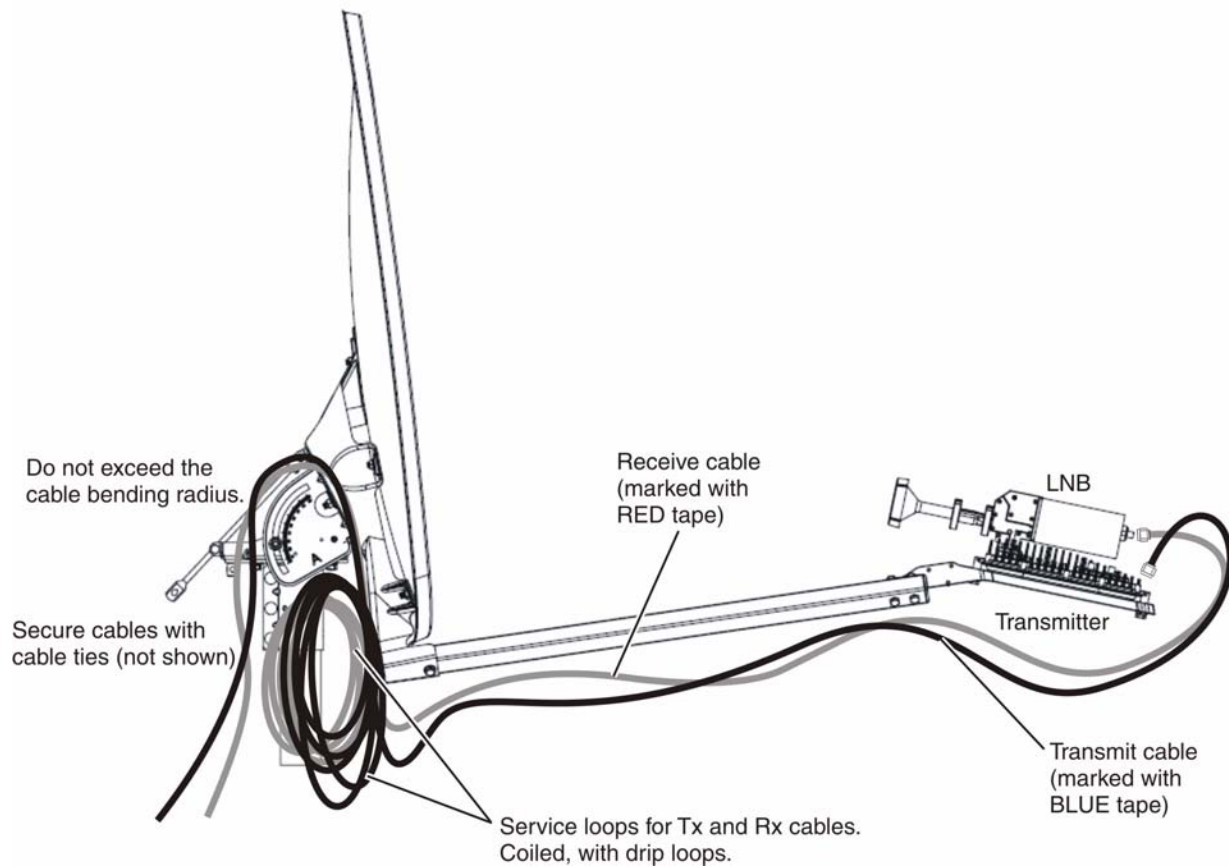


Figure 26: Transmit and receive cable configurations

2. Leave a 10-foot service loop secured to the mast, Az/EI mount assembly, or reflector bracket.



Note:

1. Do *not* leave the service loop on the roof or other mounting surface.
2. Do *not* block access to the adjustment nuts on the Az/EI mount assembly.

3. Coil the extra cable, leave a drip loop, and secure the Tx cable with cable ties.
4. Route the Rx cable (marked with red electrical tape) over the Az/EI mount assembly, down behind the reflector, and along the feed support arms to the LNB, in a configuration similar to that shown in Figure 26 above.



Note: Do *not* exceed the minimum bending radius specified by the cable manufacturer.

5. Leave a 10-foot service loop secured to the mast, Az/EI mount assembly, or reflector bracket.



Note:

1. Do *not* leave the service loop on the roof or other mounting surface.
2. Do *not* block access to the adjustment nuts on the Az/EI mount assembly.

6. Coil the extra cable, leave a drip loop, and secure the Rx cable with cable ties.

---

## Connecting the transmit and receive cables

This section explains how to connect the Tx and Rx cables to the radio assembly at the antenna.



Note: You should secure all cable connections with dielectric grease and weatherproofing tape as shown in Figure 27. However, because the antenna pointing procedure requires that you disconnect the cables, you should wait until the pointing process is complete before weatherproofing the connections.



Figure 27: Weatherproofing the cable connectors

**Transmit cable** Connect the Tx cable to the radio transmitter as follows:

1. Remove power from the satellite modem.
2. Connect the Tx cable (marked with blue electrical tape) to the transmitter connector marked *IFL*, shown in Figure 28.

---

### CAUTION

**Coaxial cables and connectors can corrode if exposed to moisture. Use *only* compression type connectors, and weatherproof them with dielectric silicone grease and weatherproofing tape.**

---

3. Tighten the cable connector to 22 in-lb with a torque wrench.
4. Apply dielectric silicone grease to the connection.
5. If necessary, secure the cable with cable ties.

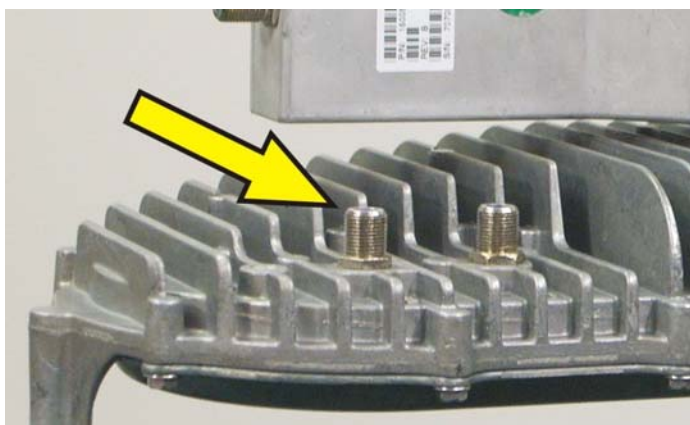


Figure 28: Transmit connector

**Receive cable** Connect the Rx cable to the LNB as follows:

1. Ensure that power has been removed from the satellite modem.
2. Connect the Rx cable (marked with red electrical tape) to the receive connector on the LNB, shown in Figure 29.

---

### CAUTION

Coaxial cables and connectors can corrode if exposed to moisture. Use *only* compression type connectors, and weatherproof them with dielectric grease and weatherproofing tape.

---



Figure 29: Receive connector

3. Fill the connector with dielectric silicone grease and tighten the cable connector to 22 in-lb with a torque wrench.

4. If necessary, secure the cable with cable ties.
5. After both the Tx and Rx cables are connected to the radio and the satellite modem, reapply power to the satellite modem in accordance with the instructions in the satellite modem installation guide.

## Ground connections

Ground the antenna mast at the Az/EI mount. Figure 30 shows the location of the ground screw. For specific grounding procedures, refer to the sources listed in *Grounding* on page 5.



Note: Although the radio transmitter contains a ground screw, a separate ground wire to the radio assembly is not required; the radio assembly is grounded through the metallic shield of the coaxial cable.

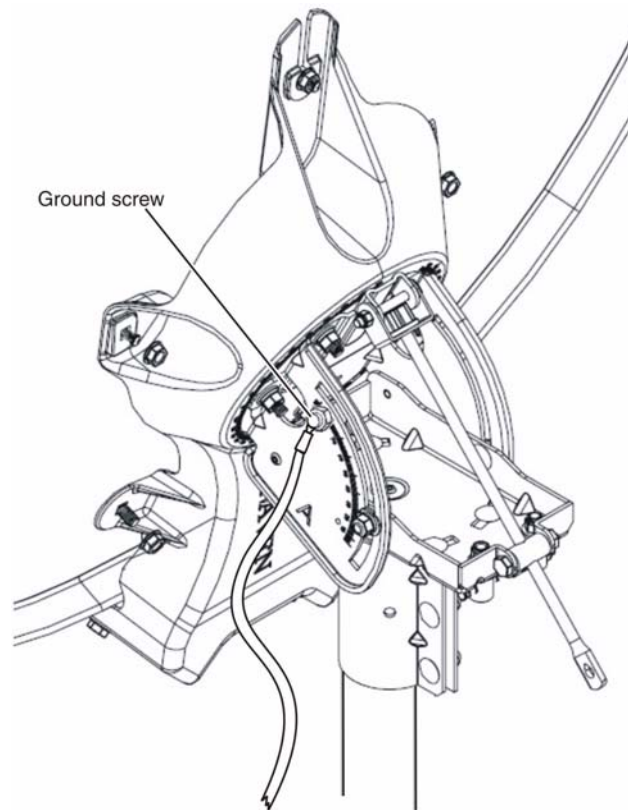


Figure 30: Ground screw location on the Az/EI mount

This completes the installation. You must now point the antenna. See the HughesNet System *Ka-Band Antenna Pointing Guide* (1037663-0001) for details.

## Chapter 5

# Adjusting the antenna azimuth and elevation

---

This chapter describes the process by which to adjust the antenna azimuth and elevation to the correct position. As the installer, you will perform these procedures during the antenna pointing process. This chapter discusses the mechanical adjustments used to modify the position of the antenna only. It does *not* discuss the pointing process itself. For information on pointing the AN8-098R and all HughesNet Ka-Band antennas, see the HughesNet ***Ka-Band Antenna Pointing Guide*** (1037663-0001).

This chapter contains the following sections:

- *Adjusting the elevation* on page 40
- *Adjusting the azimuth* on page 42

---

## Adjusting the elevation

1. To begin, unlock the elevation by loosening the two 5/16-inch elevation lockdown nuts on either side of the Az/EI mount. Figure 31 shows the location of the nuts (only one nut is shown).

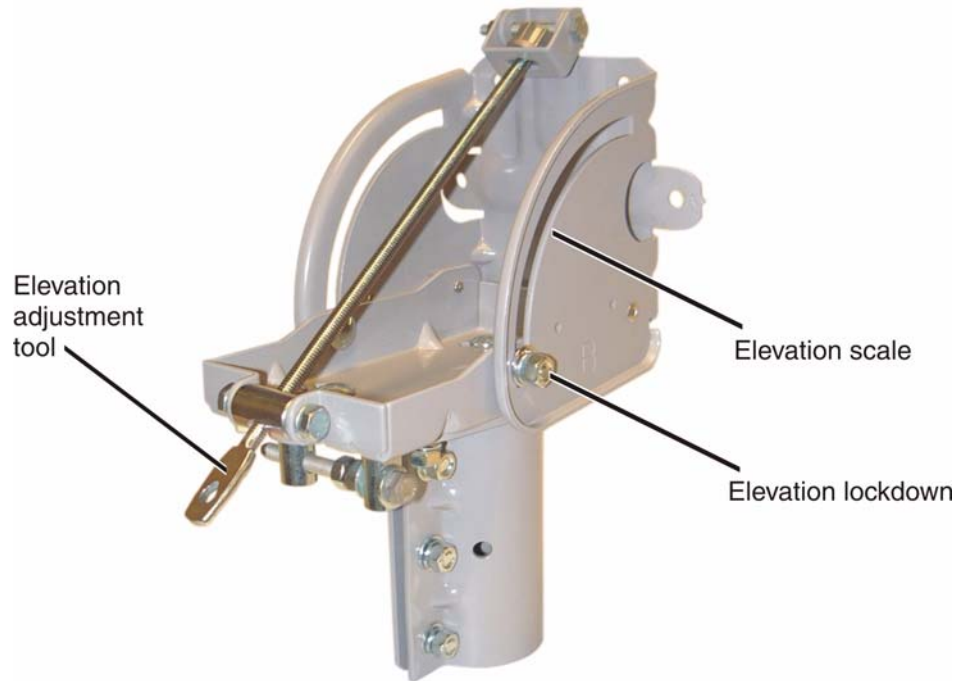


Figure 31: Elevation adjustment components

2. Insert the elevation handle into the hole at the bottom of the elevation adjustment tool as shown in Figure 32 and rotate it 90° to lock it in place.

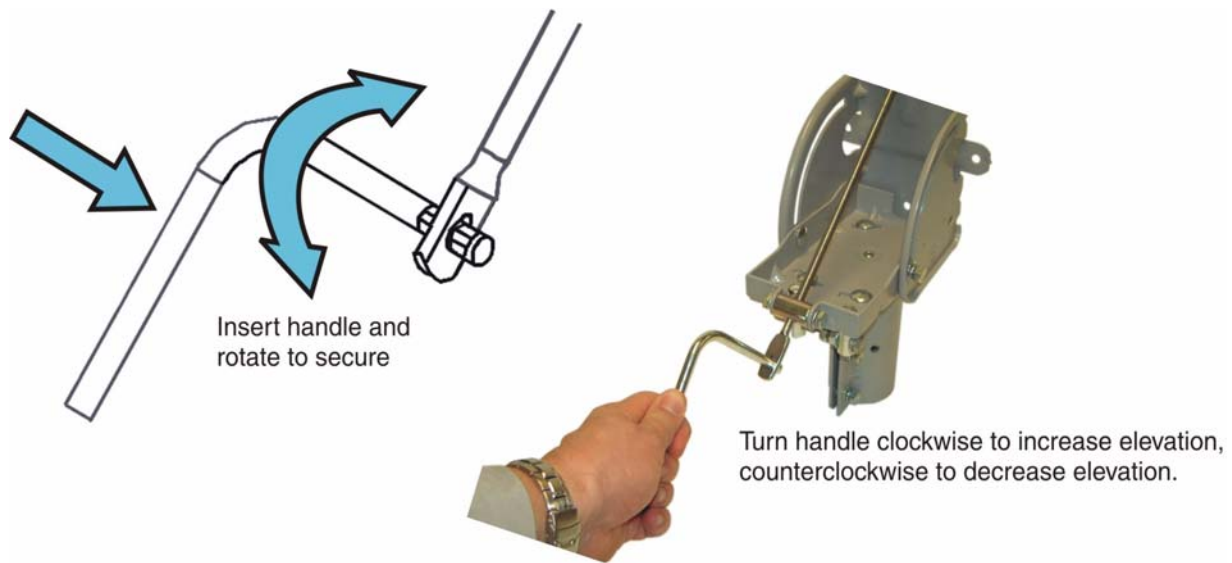


Figure 32: Adjusting the elevation

3. Turn the handle to adjust the elevation. As shown in Figure 33, the pointer on the lockdown nut indicates the value in the elevation scale. For example, the antenna shown in the figure is adjusted to 42°.

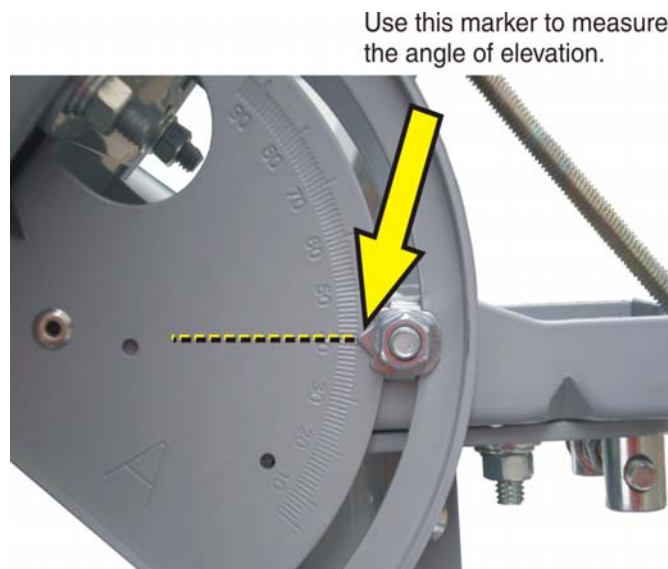


Figure 33: Elevation marker

4. Tighten the two lockdown nuts on either side of the Az/EI mount using a ½-inch socket and torque wrench to secure the elevation setting in place.

---

## Adjusting the azimuth

1. Be sure that the three 5/16-inch azimuth lockdown nuts at the bottom of the Az/EI canister (shown in Figure 34) are loose enough that the canister rotates freely on the mast.

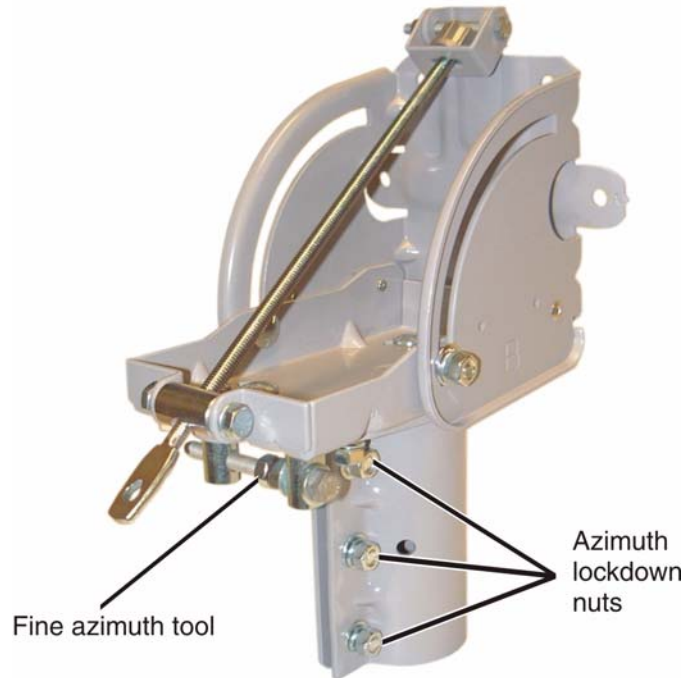


Figure 34: Loosen the Az/EI canister

2. Manually point the antenna reflector in the appropriate direction as indicated on the installation reference sheet.

---

### CAUTION

**Do *not* attempt to adjust the azimuth manually by pulling on the antenna reflector or feed support arms. Doing so could cause permanent damage to the antenna.**

---

3. Tighten the three lockdown nuts to secure the antenna in position.
4. Loosen the four 5/16-inch carriage bolts on the bottom of the azimuth base, shown in Figure 35.

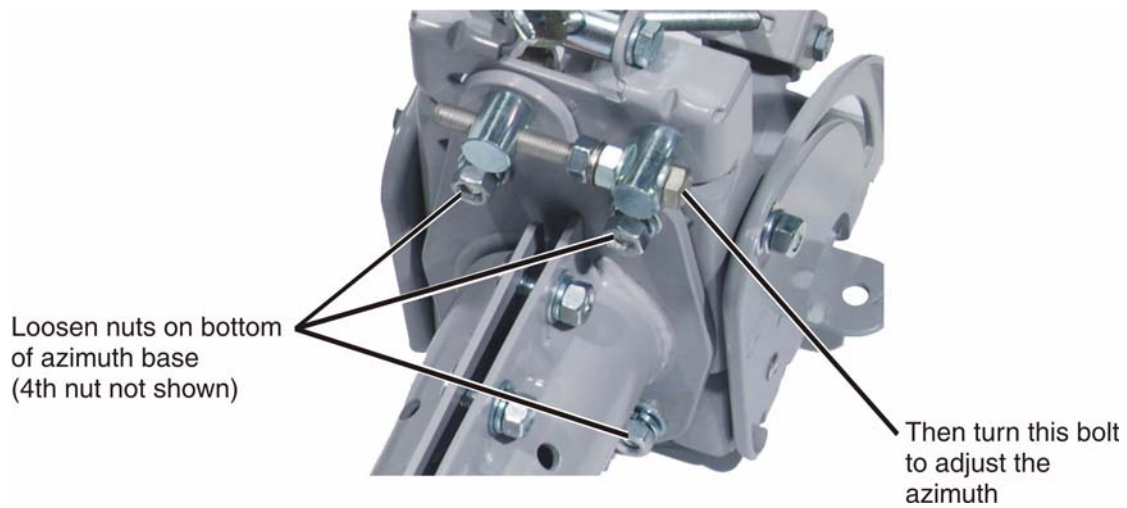


Figure 35: Adjusting the azimuth

5. Turn the 5/16-inch fine azimuth adjustment bolt at the right side of the azimuth base to achieve the desired azimuth angle.



Note: Azimuth measurements are calibrated relative to *true* north, not magnetic north.

6. Verify the azimuth with a compass and lock down the four 5/16-inch carriage bolts on the bottom of the azimuth base to 177 in-lb using a 1/2-inch socket torque wrench, tightening opposing corners uniformly.



# Acronyms and abbreviations

---

## **A**

---

Az – Azimuth

## **E**

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El – Elevation

## **F**

---

FSB – Field service bulletin

ft – Foot/feet

ft-lb – Foot-pounds

## **G**

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GPS – Global positioning system

## **H**

---

hr – Hour/hours

## **I**

---

IFL – Intra-facility link

## **L**

---

LHCP – Left-hand circular polarization

LNB – Low noise block converter

## **M**

---

m – Meters

## **N**

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NEC – National Electrical Code

NOCC – Network Operations Control Center

## **R**

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RF – Radio frequency

RHCP – Right-hand circular polarization

Rx – Receive

## **T**

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TRIA – Transmit/receive isolation assembly

Tx – Transmit



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